AI IN DERMATOLOGY SUMMIT 2026 · E-POSTER

Episode-Based Melanoma Risk Stratification Using Artificial Intelligence

Survival predictions that update every time something happens to the patient

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0.913 C-index, melanoma-specific survival
Combined episode-based model · IBS 0.040

0.886 Relapse-free survival

0.867 Overall survival

BACKGROUND

Staging tells us how risky a patient looked the day they were diagnosed. It cannot tell us how risky that same patient is today — after surgery, a recurrence, or two lines of therapy.

OBJECTIVE

Build and validate survival models that recalculate risk every time a clinically relevant event occurs, and that a clinician can inspect and explain.

METHODS

6,327 Patients with invasive cutaneous melanoma

>13,000 Clinically relevant events captured

12 Spanish institutions, 2014–2024

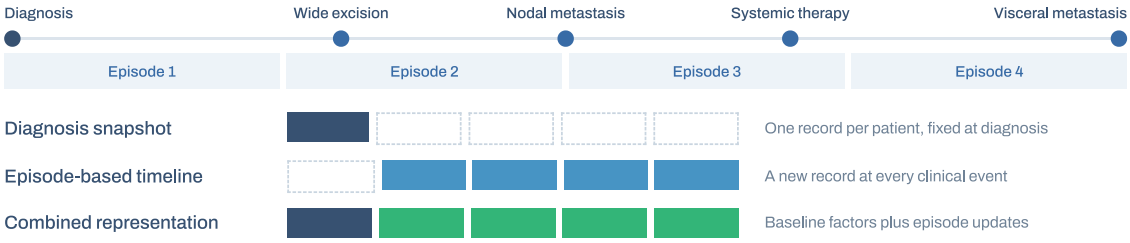
3.6 y Median follow-up (inverse Kaplan–Meier)

Every clinically relevant event — diagnosis, surgery, nodal or visceral metastasis, each line of systemic therapy — was recorded and harmonised in the **Athena** platform. Each event opens a new **episode**, and survival is re-predicted from that moment onward.

Gradient Boosting Survival · left truncation and competing risks · C-index, time-dependent AUC, IBS, Brier@5y · SHAP · TRIPOD+AI.

EPISODE-BASED MODELLING

A patient's history is cut at every clinical event. Each resulting episode is a full snapshot of where that patient stands at that point in time.



RESULTS

HOW TO READ THESE NUMBERS

C-index — how often the model puts two patients in the correct order of risk. 0.50 = coin flip, 1.00 = perfect; above 0.80 is strong discrimination.
IBS / Brier@5y — average gap between predicted and observed survival, so it measures calibration, not just ranking. 0 = perfect, lower is better.

All three representations looked equally good at diagnosis. Only the episode-based ones were still accurate later in follow-up.

C-index during follow-up · melanoma-specific survival

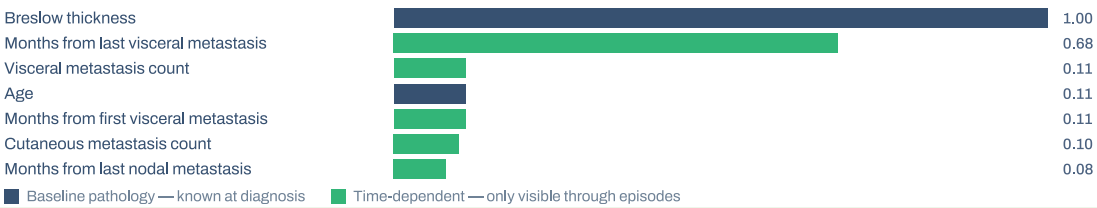
Green tick = same model measured at diagnosis (0.87). The snapshot model also lost calibration during follow-up (Brier@5y 0.303); ΔC-index +0.18 for melanoma-specific survival.

Final combined model

Endpoint	C-index	IBS
Melanoma-specific survival	**0.913**	0.040
Relapse-free survival	**0.886**	0.115
Overall survival	**0.867**	0.075

Clinician review of discordant cases (≈6%) confirmed clinical plausibility.

What drives each prediction · SHAP relative importance, melanoma-specific survival



CONCLUSIONS

Risk changes during follow-up. Models built only on data from diagnosis stop being accurate; episode-based models do not.

Baseline pathology plus what has happened since gives the most accurate and best-calibrated predictions.

Every prediction is explained by named clinical variables, so it can be discussed with the patient in clinic.

Reported following TRIPOD+AI (BMJ 2024;385:e078378). Correspondence: Xarxa Melanoma de Catalunya · Hospital Clínic de Barcelona.